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Method for producing a pipe-shaped blank out of fine sheet-metal or finest sheet metal

Abstract
A process is known for producing pipe-shaped blanks from fine sheet-metal or finest sheet metal, especially for cylindrical can-blanks or containers, whereby two edges along the length of a pre-formed sheet-metal are aligned with each other and positioned in regard to a focal region of a laser device, and subsequently these aligned length side edges are welded to each other by application of a laser beam while creating a length-oriented seam. In order to provide a process for producing pipe-shaped blanks of fine sheet-metal or finest sheet metal, which omits the disadvantages of resistance-pressure welding, and on the other hand allows for welding rates with regard to laser weld processes above 100 m/min, the welding is carried

out from the outside and/or inside with a laser-diode beam stretched in length in the focal region, whose length corresponds to a multiple of its width in the focal region.

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Description

The present invention concerns a process for producing pipe-shaped blanks of fine sheet-metal or finest sheet metal, especially cylindrical can-blanks or containers, whereby the two length edges of the pre-formed sheet-metal are aligned with each other and positioned in regard to a focal region of a laser device, and these aligned edges are subsequently welded to each other along the length by application of a laser beam while creating a length seam.

These kind of processes for producing blanks of cans, which are also called can-containers, are known, in general, in the area of the packaging industry.

The portion of the metal cans as packaging containers is at about 30% since the introduction of plastics as packaging material over twenty-five years ago.

In the production of pipe-shaped bodies of fine sheet-metal or finest sheet metal, especially of cans, the resistance-pressure welding method is typically applied. A cut of flat sheet metal, whose edge along the length corresponds to the height of the can and whose other edge corresponds to the circumference of the intended can, is initially bend or rolled into a pipe-shape by this method. The sheet-metal is made to overlap at the length seam and exposed at spots under pressure to an electrical AC-current. The pipe-shaped cut is then welded at the contact points of the superimposed sheet-metal edges. High welding rates in the order of about 100 meters per minute can be achieved with this method. However, this process requires providing copper wires between the sheet-metal and the contact rolls, which can also take up molten tin in order to keep the utilized contact rolls during the resistance-pressure welding free of build-up of material. These copper wires, which are contaminated by molten tin, cannot be used for additional welds after the welding. For this reason this process is also known under the name "wire-lost" process. To obtain reproducible weld seams, a high degree of precision of the alignment device and control of the process parameters are required by the edges of the seems which are to be welded together.

In addition, the seam area has to be overlapped. An accumulation of material occurs in the area of the seam, which is 1.4 times as thick as the rest of the material. The subsequent processing steps have to be designed to accommodate this enlargement.

Another problem area with this kind of cans made of tin sheet-metal is that a coating with resin is required in food applications at least for the inside of the cans, which has to be

applied in the region of the seam after the welding. A uniform coating of the overlapping edges after the welding is not ensured. Furthermore, process speeds are required due to the increasing growth rates in the area of the packaging industry, which cannot be met nowadays with the process speeds of can manufacturing by resistance welding of 100 m/min.

A switch-over occurred already in 1976 from the resistance welding with contact rolls as described above to laser welding; this kind of method has been described in DE-OS 27 427.

According to this method a rectangular cut is bend cylindrically such that its side edges are flush against each other. They are then welded to each other with a spot-shaped laser beam moved relative to the object. However, it has been found that the process speed with this process is not above 80 m/min. Furthermore, swelling of the melt occurs along the seam, especially at higher welding speeds, which again leads to an irregular seam. This effect is known under the name "humping-effect". Another problem associated with higher process speeds is a precise relative motion of the can-blank to the laser, with the result that already slight misalignments and/or vibrations during the movement of the can blank lead a faulty and therefore not lacquer-coated length seams.

During the last years more arrangements and processes have been suggested for welding of sheet-metal parts out of fine sheet-metal with a seam along their length.

For example, DE-OS 36 00 532 provides a process for producing a container made of thin sheet-metal such as thin fine sheet-metal and/or finest sheet metal, whereby the areas of the edges along the length of the blank are aligned to overlap and are welded to each by melting the material without separate welding material. This welding occurs either in an average region of the overlap or at the face-side edges of the region of the edges along the length which are aligned in parallel to each other. The overlap area is additionally folded over or rolled in after the welding, so that a form-stabilizing bulge is created.

DE-OS 32 06 210 provides for a process and a device for producing metallic container cases which are open on both sides and have a length seam welded by a laser beam. The length edges to be welded are aligned in a holding and clamping device to overlap each other, and are welded by means of a laser beam at about the center of the overlap. Afterwards, the overlapping part is also cut off with another laser beam. This process is cumbersome because of this additional cut-off processing step, and is therefore not suitable for high process speeds. Moreover, a sharp edge can be created along the cut edge or an acute angle, which has to be viewed as disadvantage.

DE-OS 34 07 417 provides for a process and a device for welding the edges along the length of can material, in which the edges are pressed against each other at the face sides during the welding, and where the sheet-metal of the can is pressed at least at the left and right side of

the needed weld seam perpendicularly to the can material against a support. The laser beam and the can-blank, which is being welded, are moved relative to each other, whereby welding speeds are between 20 to 80 m/min. To align the length edges, which are to be welded together, the length edges are initially placed in an X-directional track, the edges are clamped in, and the X-track is afterwards removed so that a gap is created between the two face sides of the edges which has to be closed later on.

DE-OS 36 30 889 presents again as advantageous the overlapping welding of the edges along the length, which are to be joint.

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According to the publication, the edges along the side are positioned on top of each other such that the lower edge region and the overlapping top edge region above it each run in a plane which is at an angle to the other. Since the top edge region in this angled position stands up from the lower edge region, a laser beam can be guided from the outside in between both edges, which welds the two length edges at the internal line together with each other at the contact line. The outer, protruding surface section has to be worked off after the welding; it is either removed or bend over in some fashion, or pressed against the wall of the can.

DE-OS 36 32 952 also presents a process and device for continuous production of pipe-shaped objects with laser-length seam welding, whereby object and laser beam are moved relative to each other, namely by forming a small molten zone.

DE 37 03 270 presents a process for producing containers with a flush-welded length seam according to which the edges along the length, which are to be welded, are initially held at a distance and are brought together in the welding zone at an acute angle, and after the edges have been welded together are pressed tangentially against each other until the weld seam has cooled down.

DE-OS 39 01 319 describes a process in which two overlapping sheet-metal pieces are aligned with each other at the edges which are to be welded, and are joint by rolling and by melting the overlapping areas. This process requires on one hand a relatively elaborate roll system, and a relative motion of the parts to be joined and the rolls, and moreover, this process is only suitable with difficulties for processes in conjunction with pipe-shaped blanks, which have to be welded together at their edges along the length.

Another process is known from DE-OS 38 28 341, in which the edges along the length, which are to be welded, are aligned with each other to overlap, and where the overlapping regions have to be removed.

Based on the above presented stated of the art, the task of the present invention is to provide a process for producing pipe-shaped blanks of fine sheet-metal or finest sheet metal, which

avoids the disadvantages of resistance-pressure welding, and on the other hand allows for welding speeds of over 100 m/min with regard to the laser welding process.

The above task is solved by the process of the kind stated at the beginning, whereby the welding is carried out from the outside and/or inside with a laser beam stretched in length in its focal region, whose length is a multiple of its width in the focal region. The welding of the length edges of the can-blanks or the can-containers can be carried out with a laser-diode beam shaped in this way without having to move the two parts relative to each other. This is aided by the fact that a diode-laser typically has a beam with an elliptically shaped cross-section; the weld seam is parallel to the pn-transition of the diodes. These limits in beam divergence can be focused by optical devices, or also further increased by arranging multiple laser-diodes in the length direction of the seam, which is to be welded, or can be additionally focused perpendicular to the seam to advantageously adapt the beam geometry precisely to the requirements during the welding of the edges along the length of the can blank, so that the stress of the beam occurs only in the weld area.

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It is advantageous in this case that the appropriate extension or appropriate structure of the laser-diode arrangement, which is utilized for the welding, aligns the length extension of the beam in the direction of the length seam, and that during the welding period the predetermined coordinates of the length edges of the sheet-metal as well as those of the focal region are maintained relative to each other. Very high welding speeds can be achieved with this kind of stationary welding; furthermore, the problems of "humping-effects" do not appear, i.e. the humping of the melt of a point-shaped, focused laser beam running along the weld seam do not appear. Moreover, even the bordering zones of the edges along the length, which are to be welded together, heat up evenly with this type of arrangement, so that distortions do not occur from welding due to different and/or subsequent heating and cooling along the welded seam. It has been found that the two length edges of the can-container can be aligned positioned flush to each other with this kind of welding arrangement, especially since due to this kind of a stationary arrangement an even heating occurs of the zones of the sheet-metal blank, which are to be welded together, and afterwards an even cooling. Especially in regard to the even, gentle heat-up, welding, and cool-down profile along the length seam and in cross-direction to the welded seam, it can be advantageous to expose the neighboring regions of the edges along the length before, during, and/or after the welding to a heat treatment, which is preferably conducted with a laser beam of the same laser arrangement which is used to weld the length edges. The can-blank remains by this type of processing method during the whole heating and/or cooling period in the same coordinate-controlled position as is also maintained during the welding of the length edges.

Since the orientation of the edges along the length based on coordinates remains unchanged during the welding relative to the focal region of this beam, a heat-up device independent of the laser arrangement for welding can be assigned to the coordinates of the length edges in a

simple manner. Especially a multiple diode-laser arrangement, whose laser diodes are arranged in cross-direction to the length of the weld seam, which is to be created, allows the diode beam to be split into a high-energy welding beam region and on both sides of it a heating beam region of lesser energy. A so-called multiple-diode laser arrangement or a multi-diode laser block, hence, a diode laser arrangement made of a plurality of laser diodes, is used, which are assigned to different coordinates along the length edges, and which together result in a length extended laser beam, which furthermore provide a heating and welding profile which differs and can be controlled due to the different arrangement and power control of the individual laser-diodes in cross-direction to the length of the seam.

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To achieve a gentle adaptation of the sheet-metal parts to the temperature before and after the welding in the region of the edges along the length, which are to be welded, it is viewed to be advantageous to operate the laser arrangement before and after the welding at a power which is smaller than the power required for welding.

An advantage is achieved in certain cases in the production of can-containers according to this method, when the length seam to be produced is divided in the direction of the seam into two or three welding regions predetermined by coordinates. Breakage points can be created with this kind of division at the transition areas between the individual welding regions as determined by coordinates, possibly by a very slight overlap of the individual, predetermined welding regions, to include an opening aid, for example, in these areas in conjunction with a groove in the wall of the object body along which the filled can could be easily opened. It is difficult to separate the top part and the bottom part of the can from each other without such a designated breakage spot also being present in the region of the welded length seam of the can, since the welded length seam typically represents a very stable joint. Two breakage spots designated by coordinates located close to each other can be created with a threefold division of the weld region along the length seam, which are located in the area of two breakage lines cut around the circumference of the can, so that the strip of can between both designated breakage lines can be pulled out when opening the can by winding it in spiral shape around an accessory part. A single laser diode arrangement can be used to achieve the two or three focal regions required for incorporating these above stated designated breakage areas, which is designated by coordinates to the two or three focal areas and is swiveled after the welding of each of the welding regions, to expose the next welding region without relative motion between the can-case and focal region.

It can be seen that a stationary welding with the use of a laser-diode arrangement, i.e. maintaining the coordinate-controlled alignment of the focal region with the length edges to be welded during the welding, allows to achieve very high welding velocities in comparison to an arrangement in which the laser beam or the focal region have to be moved along the length seam, or in which the can-container is moved relative to the laser beam. In order to still further increase the number of can-containers able to be fabricated, a processing method

is advantageous by which the laser arrangement is shifted between at least two different processing stations, whereby the processing of can-blanks switches alternates from one to the other processing station. During the welding of one can-container at one processing station, the pre-formed sheet-metal can be aligned coordinate controlled along its length edge in the other processing station. The shifting of the laser beam is preferably conducted with a rotating prism, which is cyclically turned or pivoted. This kind of rotating prism offers among others items the advantage, that because of several reflection surfaces at several angles to each other, several processing stations can be provided one after the other with a laser beam by small movements of the prism.

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Thus, a large moving mass and focusing system after the prism is eliminated. Furthermore, the rotating prism can follow the moving can-container, so that no relative motion has to occur between the laser focus area and the treatment area, whereas the emission source can be rigidly installed on the machine without movement. This way the containers can move uniformly and do not have to always be stopped welded, and then accelerated again.

It has been found that this process of welding sheet-metal cuts along the length edges should be conducted for the purpose of creating can blanks in conjunction with a laser diode arrangement with a power of 10^4 to 10^5 W/cm^2 to achieve a seam uniform along the length even in combination with high welding velocities, i.e. short welding times. The time period for the welding with a laser beam of this power can be cycled with individual pulses between 10 to 500 msec.

Additional advantages and characteristics of the invention result from the following description of design examples with the use of drawings. Shown in the drawings are in

Fig. 1 a part of a pipe-shaped cut of an image with edges along the length positioned flush against each other with a laser diode arrangement positioned on the outside,

Fig. 2 a part of a pipe-shaped, bend cut of sheet-metal with edges along the length positioned flush against each other with a laser diode arrangement assigned to them, which compared to Figure 1 is divided into two sections along the length edges which are to be welded,

Fig. 3 a can with a length seam and an inserted bottom piece,

Fig. 4 a cut through the can of Fig. 2 in cross-direction to the length seam,

Fig. 5 an arrangement according to Fig. 1 with an additional laser-diode arrangement at the inside of the pipe-shaped, bend cut of sheet metal,

Fig. 6 a schematic representation of a processing station with a laser-diode arrangement, which bundle of beams is moved in cycles between two separate processing stations aimed on pre-formed, pipe-shipped cuts of sheet-metal along their joined length edges,

Fig. 7 schematically a multiple arrangement of individual laser-diodes,

Fig. 8 a stack of individual laser-diodes in form of a laser-diode arrangement, and

Fig. 9 schematically a multiple arrangement of laser diodes, to which belong a common focusing optic to focus the beam on the length seam of a can-container.

Tin cans as shown schematically in Fig. 3 are widely used in the packaging industry with a pipe-shaped, bend piece of sheet-metal 1, a flat, possibly fluted can bottom 2, and a cover part, which is not shown and put in place after the can has been filled. The pipe-shaped sheet-metal piece 2 is welded along the length seam 3. The bottom part 2 is usually connected to the edge of the pipe-shaped piece of sheet-metal 1 by beading or folding. Metal cans are also coated on the inside and possibly on the outside, for example, with a polymer coating or a resin layer 5 as can be seen in the cut view in Fig. 4.

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To weld the edges along the length of the pipe-shaped sheet-metal 1, the face-side edges 6 of the pipe-shaped, pre-formed body are aligned in a processing station to join flush as shown in Fig. 1, 2, and 5. A laser-diode arrangement 7 is assigned in the length direction of the face edges, which is shown schematically in the Figures with a heat sink 8 which carries several laser diodes on its side facing the pipe-shaped sheet-metal part 1, whose beam exit opening is aligned in such a way with the length seam 3 and is distributed along it, so that a length-extended bundle of beams 9 is formed with a small focal region extending along the face-side edges 6. In this case the laser-diodes, which posses a beam with an elliptical cross-section, are arranged in an advantageous design with the particular larger axis in the direction of the length seam 3, which is to be created, whereas the smaller axis runs perpendicular to the length seam 3, so that a length-extended focal region 10 is already obtained just due to the appropriate arrangement and orientation of the individual laser-diodes, which is required for the intended welding of the face-side edges 6 of the pipe-shaped piece of sheet-metal 1 to each other. Additional transmitting focusing arrangements can possibly be added to direct the laser-diode beam to the focal region along the face -side edges 6. The pipe-shaped piece of sheet-metal 1 and the laser-diode arrangement 7 or its bundle of beams 9 can remain unchanged at their predetermined coordinates during the welding process, so that stationary welding can proceed without relative motion between the pipe-shaped piece of sheet-metal 1 and the bundle of beams 9. The welding is carried out with very short welding pulses at a power in the range from 10^4 to 10^5 W/cm^2, whose length amounts to 10 to 50 milliseconds depending on the power level set and the thickness of the sheet metal. The pipe-shaped piece

of sheet-metal 1 is removed from the processing station after the welding and a new, not yet welded, pipe-shaped piece of sheet-metal 1 is arranged based on coordinates with its face-side edges 6 joined flush in the focal region 10 of the laser-diode arrangement 7.

Due to the additional optic or due to an arrangement with which the laser-diode arrangement 7 can be moved in its distance to the surface of the pipe-shaped piece of sheet-metal 1, the focal region can be widened in cross-direction to the length seam 3, which is to be created, so that the bordering zones of the piece of sheet-metal 1 can be heated up before and/or after the actual welding process in order to avoid a temperature gradient up to the welding temperature which is too large in the sheet metal; the same applies after the welding of the face sides 6 to each other so that a gentle cool-down can ensue.

Fig. 2 shows a pipe-shaped piece of sheet-metal 1 in form of a cut-out similar to that in Fig. 1, whereby the piece of sheet-metal has been cut slightly at its outside, so that a groove 12 runs around its circumference which is used later on to open the can at a predetermined fracture line. To also obtain this predetermined fracture area along the length seam 3, which is to be created, the laser-diode arrangement 7 of Fig. 1 is divided into two individual laser-diode arrangements 13, which each point a bundle of laser beams 9 from both sides of the groove 12 on the face -side edges 6 of the pipe-shaped piece of sheet-metal 1.

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The bundle of beams 9 can overlap slightly in the region of groove 12, but they are adjusted such with regard to their beam power that the power is smaller in the region of groove 12 than along the face-side edges 6 extending along both sides of groove 12, so that a predetermined fracture region still remains after the welding at the cross-section of the face-side edges 6 along the length seam 3.

A schematic arrangement is shown in Fig. 5 in which an additional laser-diode arrangement is positioned at the inside of the pipe-shaped piece of sheet metal compared to Fig. 1, whose bundle of beams 9 are aimed at the bottom side of the face-side edges 6. This kind of arrangement allows for the simultaneous welding of the face-side edges 6 of the pipe-shaped piece of sheet-metal 1 from both sides of the face-side edges 6, i.e. from the inside and from the outside. Since typically little free space remains on the inside of this kind of pre-formed, pipe-shaped piece of sheet-metal 1, a laser arrangement of lower power can be utilized on the inside of the pipe-shaped piece of sheet-metal 1 in order to insert it directly into the interior space of the pre-formed, pipe-shaped piece of sheet metal. Since a laser-diode arrangement with a multitude of individual laser-diodes can be set up on purpose in a length extended arrangement, the laser beam can be utilized due to the structure of the laser-diode arrangement in the interior space of the pipe-shaped can blank. The exterior laser-diode arrangement 8 and the interior laser-diode arrangement 14 are preferably operated at the same time during the welding process. After the pipe-shaped piece of sheet-metal has been welded along the face-side edges 6, the seam can be covered up with a liquid resin 15 along

the length seam 3 on the inside and outside as can be seen in Fig. 4, so that the piece of sheet-metal 1 is completely covered together with the resin layer 5.

Since only very short welding times are required for the welding due to the stationary alignment of the bundle of beams with the face-side edges 6, a processing station can be set up as schematically shown in Fig. 6 to increase the processing speed for the given arrangement. In this arrangement a length-extended diode-laser beam with a laser-diode arrangement 10 is shifted by means of a movable optic, for example, a planar mirror 17, between two pipe-shaped pieces of sheet-metal 1, which have been firmly aligned by coordinates. The one piece of pipe-shaped sheet-metal 1is aligned in this arrangement such that the bundle of beam 9 of the laser-diode arrangement 16 is aimed directly at the face-side edges 6, possibly with an additional focusing optic 18 (the mirror 17 has been moved in this case to the position shown by the dashed line, whereas it is swiveled back by an angle 16 in the path of the beam to weld the face-side edges 6 of the other pipe-shaped piece of sheet-metal 1, so that the bundle of beams is aimed at the face-side edges 6. The pre-formed, pipe-shaped pieces of sheet-metal 1 are welded in cycles alternating between the two processing stations. The individual pipe-shaped pieces of sheet-metal 1 can again be held in a turn-table arrangement at the particular processing station, which turns cyclically such that the particular face-side edges 6 of the individual pipe-shaped piece of sheet-metal 1 mounted on the table are positioned in aligned manner based on coordinates to the focal region of the bundle of beams 9 of the laser-diode arrangement 16.

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A rotating prism can be utilized in place of mirror 17. This is of particular advantage when more than one processing stations have to be served at the same time by a laser arrangement. Furthermore, mirror 17 or the utilized prism can be moved along using a suitable drive with the moving can-blank, so that no relative motion between the blank or length seam and the focal region occurs.

A multiple arrangement of individual laser-diodes or laser emitters 20 is schematically shown in Fig. 7, which is set up on a common cooling body 8. A beam exits from the individual exit windows as is schematically indicated at the top, rear laser emitter 20. The cones of the beams of the individual laser emitters 20 complement each other accordingly to form an extended laser beam, which can be focused on the face-side edges 6 or the area of the length seam 3, for example, by a focusing lens 21 as shown in Fig. 9. The multiple arrangement of the laser-diodes of Fig. 7, which are also called a laser-diode-bar, has a length of about 10 mm, a width of 0.6 mm, and a height of 0.1 mm, whereby up to 800 individual laser-diodes can be arranged on a bar of this size. The individual laser-diodes 20 can posses a beam area in the size range of 1 * 3 μm with divergence angles in the range of 1000 mrad in the plane orthogonal to the row of individual laser-diodes 20 and about 200 mrad in a parallel plane. The maximum achievable power of the individual laser-diodes is in the range of 6 mW, from which a power density of about $2 * 10^6$ W/cm^2 results based on the stated size of the emitting

surface of 1 µm * 3 µm. This way the individual laser diodes can be combined with each other in any arbitrary manner in order to obtain on one hand from the relative arrangement of laser diodes a desired, length-extended cross-section of the beam, and on the other hand a high power density required for the welding.

Fig. 5 shows the combination of the individual laser-diode to a bundle which are separated from each other by cooling bodies 8. The cooling elements or cooling bodies 8 have in this case a thickness of about 0.3 to 2 mm. Furthermore, openings 22 are provided through which a liquid or gaseous fluid can pass during the operation to remove the heat created by the laser-diodes. A very high packing density of up to 25,000 individual laser-diodes per cm^2 can also be achieved with this bundling technique.

An arrangement of three laser arrays stacked on top of each other is shown in Fig. 9, who's diverging beams are formed by a collimator 23 to a parallel bundle of beams and aimed by a focusing lens 21 on the face-side edges 6 of the can-container.

Patent Claims

1. Process for producing pipe-shaped blanks out of fine sheet-metal or finest sheet metal, especially cylindrical can blanks or can-containers, in which the two length side edges of a pre-formed piece of sheet-metal are brought next to each other and are positioned with regard to a focal region of a laser arrangement and were afterwards these aligned edges along the length are welded to each other by exposure to a laser beam to form a length seam, **characterized by** the welding being conducted from the outside and/or inside with a diode-laser beam with length-extended focal region, which length is a multiple of its width in the focal region.

2. A process according to Claim 1, characterized by the length extension of the cross-section of the beam being aligned in the direction of the length seam, and by maintaining the predetermined coordinates of both the length edges of the sheet-metal during the welding as well as the focal region relative to each other.

3. A process according to Claim 1 or 2, characterized by two edges along the length side being aligned to touch each other flush before the welding.

4. A process according to Claim 1 to 3, characterized by neighboring regions of the length side edges or length seam undergoing heating before, during, and/or after the welding.

5. A process according to Claim 4, characterized by using the laser beam from the same laser arrangement for heating and for welding.

6. A process according to Claim 4, characterized by utilizing a separate heating device for heating independent of the laser arrangement used for welding.

7. A process according to Claims 4 or 5, characterized by the diode-laser beam being separated in the focal region in cross-direction to the length seam, which is to be created, into a high-energy radiation region for welding and on both sides of it into a radiation region of lesser energy for heating.

8. A process according to Claim 4 to 7, characterized by operating the laser arrangement before and / or after the welding at a power level which is smaller than the power required for welding.

9. A process according to Claim 1 to 6, characterized by length seam which, is to be created, being divided in the direction of the seam in at least two coordinate-controlled, predetermined welding regions, which are exposed at the same time or one after the other to laser radiation.

10. A process according to Claim 9, characterized by the length side seam being divided into three coordinate-controlled, predetermined welding areas.

11. A process according to Claim 9 or 10, characterized by providing designated breakage areas along the length side seam between the individual welding regions by exposing these areas to a lower beam power.

12. A process according to one of the Claims 9 to 11, characterized by a single laser arrangement being used for the welding of the weld areas, which focus region is positioned coordinate-controlled to each of the welding areas before the welding.

13. A process according to one of the Claims 1 to 12, characterized by using only a single laser arrangement for the welding of the weld areas, which features two or three focal regions, which are positioned before the welding coordinate-controlled to the particular welding areas of the seam, which is to be welded.

14. A process according to one of the Claims 9 to 13, characterized by the welding areas slightly overlapping in their coordinates in the direction of the seam.

15. A process according to one of the Claims 3 to 14, characterized by utilizing different diode-lasers and/or diode-laser arrangements for the heating and the welding.

16. A process according to Claim 15, characterized by the different diode-lasers and/or diode-laser arrangements being operated at different power levels.

17. A process according to one of the Claims 3 to 16, characterized by the power of the laser arrangement in the region of the needed length seam remaining initially during the laser beam heating below the power for the welding process, and being increased after a given heating period to the welding power.

18. A process according to one of the Claims 3 to 17, characterized by the power of the laser arrangement being lowered in the region of the required length seam after the welding to an appropriate level for a post-welding heat treatment.

19. A process according to one of the Claims 1 to 18, characterized by the laser arrangement or the laser beam being moved between at least two different processing stations, whereby a cylindrical can-blank is welded alternating at the one processing station and than at the other processing station.

20. A process according to Claim 19, characterized by laser beam being moved between at least two different processing stations by a beam guidance system which is on a pivot support.

21. A process according to Claim 20, characterized by the pivoting being accomplished with a rotating prism as part of the beam guidance system.

22. A process according to Claim 20 or 21, characterized by the can-blank being guided during the welding and being thereby tracked or taken along in the focal region.

23. A process according to one of the Claims 1 to 22, characterized by the welding occurring at a power of 10^4 to 10^6 W/cm^2.

24. A process according to one of the Claims 1 to 23, characterized by the laser radiation being applied during the welding for a time period of 10 to 500 milliseconds.

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